Dataset Expocode	**33GG20130609**
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Dataset	**Funding Info:** NOAA Climate Program Office; NOAA Ocean Acidification Program **Initial Submission (yyyymmdd):** 20160119 **Revised Submission (yyyymmdd):** 20160119
Campaign/Cruise	**Expocode:** 33GG20130609 **Campaign/Cruise Name:** GU1302 **Campaign/Cruise Info:** EcoMon, AOML_SOOP_CO2 **Platform Type:** **CO2 Instrument Type:** Equilibrator-IR or CRDS or GC **Survey Type:** Research Cruise **Vessel Name:** R/V Gordon Gunter **Vessel Owner:** NOAA **Vessel Code:** 33GG
Coverage	**Start Date (yyyymmdd):** 20130609 **End Date (yyyymmdd):** 20130624 **Westernmost Longitude:** 76.4 W **Easternmost Longitude:** 66.8 W **Northernmost Latitude:** 44.5 N **Southernmost Latitude:** 35.8 N **Port of Call:** Newport, RI **Port of Call:** Norfolk, VA
Variable	**Name:** xCO2_EQU_ppm **Unit:** **Description:** Mole fraction of CO2 in the equilibrator headspace (dry) at equilibrator temperature (ppm)
Variable	**Name:** xCO2_ATM_ppm **Unit:** **Description:** Mole fraction of CO2 measured in dry outside air (ppm)
Variable	**Name:** xCO2_ATM_interpolated_ppm **Unit:** **Description:** Mole fraction of CO2 in outside air associated with each water analysis. These values are interpolated between the bracketing averaged good xCO2_ATM analyses (ppm)

Variable	**Name:** PRES_EQU_hPa **Unit:** **Description:** Barometric pressure in the equilibrator headspace (hPa)
Variable	**Name:** PRES_ATM@SSP_hPa **Unit:** **Description:** Barometric pressure measured outside, corrected to sea level (hPa)
Variable	**Name:** TEMP_EQU_C **Unit:** **Description:** Water temperature in equilibrator (°C)
Variable	**Name:** SST_C **Unit:** **Description:** Sea surface temperature (°C)
Variable	**Name:** SAL_permil **Unit:** **Description:** Sea surface salinity on Practical Salinity Scale (o/oo)
Variable	**Name:** fCO2_SW@SST_uatm **Unit:** **Description:** Fugacity of CO2 in sea water at SST and 100% humidity (µatm)
Variable	**Name:** fCO2_ATM_interpolated_uatm **Unit:** **Description:** Fugacity of CO2 in air corresponding to the interpolated xCO2 at SST and 100% humidity (µatm)
Variable	**Name:** dfCO2_uatm **Unit:** **Description:** Sea water fCO2 minus interpolated air fCO2 (µatm)
Variable	**Name:** WOCE_QC_FLAG **Unit:** **Description:** Quality control flag for fCO2 values (2=good, 3=questionable)
Variable	**Name:** QC_SUBFLAG **Unit:** **Description:** Quality control subflag for fCO2 values, provides explanation when QC flag=3
Sea Surface Temperature	**Location:** In engine room, about 2m after the seachest, before the SW pumps. **Manufacturer:** Seabird, Inc. **Model:** SBE 38 **Accuracy:** 0.001 (°C if units not given) **Precision:** 0.0003 (°C if units not given) **Calibration:** Factory calibration **Comments:** Manufacturer's Resolution is taken as Precision; Maintained by ship.
Sea Surface Salinity	**Location:** In Chem lab, next to CO2 system **Manufacturer:** Seabird **Model:** SBE 21 **Accuracy:** ± 0.05 o/oo **Precision:** 0.002 o/oo **Calibration:** Factory calibration **Comments:** Manufacturer's Resolution is taken as Precision; Maintained by ship.

Atmospheric Pressure

Location: Next to the bridge, ~15 m above the sea surface water
Normalized to Sea Level: yes
Manufacturer: RMYoung
Model: 61201
Accuracy: ± 0.5 hPa (hPa if units not given)
Precision: 0.01 hPa (hPa if units not given)
Calibration: Factory calibration
Comments: Manufacturer's Resolution is taken as Precision; Maintained by ship.

Atmospheric CO2

Measured/Frequency: Yes, 5 readings in a group every 3 hours
Intake Location: Bow mast, ~18 meters above sea surface
Drying Method: Gas stream passes through a thermoelectric condenser (~5 °C) and then through a Perma Pure (Nafion) dryer before reaching the analyzer (90% dry).
Atmospheric CO2 Accuracy: ± 0.5 µatm in fCO2_ATM
Atmospheric CO2 Precision: ± 0.01 µatm in fCO2_ATM

Aqueous CO2 Equilibrator Design

System Manufacturer:
Intake Depth: 5 meters
Intake Location: Bow
Equilibration Type: Spray head above dynamic pool, no thermal jacket
Equilibrator Volume (L): 0.95 L (0.4 L water, 0.55 L headspace)
Headspace Gas Flow Rate (ml/min): 70 - 150 ml/min
Equilibrator Water Flow Rate (L/min): 1.5 - 2.0 L/min
Equilibrator Vented: Yes
Equilibration Comments: Primary equilibrator is vented through a secondary equilibrator.
Drying Method: Gas stream passes through a thermoelectric condenser (~5 °C) and then through a Perma Pure (Nafion) dryer before reaching the analyzer (90% dry).

Aqueous CO2 Sensor Details

Measurement Method: IR
Method details: details of CO2 sensing (not required)
Manufacturer: LI-COR
Model: 7000
Measured CO2 Values: xco2(dry)
Measurement Frequency: Every 140 seconds, except during calibration
Aqueous CO2 Accuracy: ± 2 µatm in fCO2_SW
Aqueous CO2 Precision: ± 0.01 µatm in fCO2_SW
Sensor Calibrations:
Calibration of Calibration Gases: The analyzer is calibrated every 3 hours with field standards that in turn were calibrated with primary standards that are directly traceable to the WMO scale. The zero gas is ultra-high purity air.
Number Non-Zero Gas Standards: 3
Calibration Gases:
Std 1: LL70421, 0.00 ppm, owned by AOML, used every 3 hours.
Std 2: JA02280, 248.73 ppm, owned by AOML, used every 3 hours.
Std 3: JA02292, 372.88 ppm, owned by AOML, used every 3 hours.
Std 4: JA02261, 450.59 ppm, owned by AOML, used every 3 hours.
Comparison to Other CO2 Analyses:
Comments:
Method Reference:
Pierrot, D., C. Neil, K. Sullivan, R. Castle, R. Wanninkhof, H. Lueger, T. Johannessen, A. Olsen, R. A. Feely, and C. E. Cosca (2009), Recommendations

for autonomous underway pCO2 measuring systems and data reduction routines, Deep-Sea Res II, 56, 512-522.

Equilibrator Temperature Sensor

Location: Inserted into equilibrator ~5 cm below water level
Manufacturer: Hart
Model: 1521
Accuracy: 0.025 (°C if units not given)
Precision: 0.001 (°C if units not given)
Calibration: Factory calibration
Comments: Resolution is taken as Precision.

Equilibrator Pressure Sensor

Location: Attached to equilibrator headspace. Combined with Licor Pressure
Manufacturer: Licor
Model: None
Accuracy: 1.2 (hPa if units not given)
Precision: 0.02 (hPa if units not given)
Calibration: Factory calibration
Comments: Differential pressure reading from Setra-239 attached to the equilibrator headspace was added to the pressure reading from the LICOR analyzer to yield equilibrator pressure. Manufacturer's Resolution is taken as Precision.

Additional Information

Suggested QC flag from Data Provider: NA
Additional Comments: This cruise was the first use of the SBE38 sensor for SST. For most of the first two days of the cruise and during occasional intervals, the SBE38 was not logged. The difference between the SBE38 and the hull-mounted Furuno T2000 SST sensors was calculated for the 5255 analyses when the two temperatures were within 1 degree C of each other. The average difference of 0.39 (+/- 0.16) was subtracted from the Furuno temperatures to estimate the missing SBE38 temperatures. Original Data Location: http://www.aoml.noaa.gov/ocd/ocdweb/gunter/gunter_introduction.html
Citation for this Dataset:
Other References for this Dataset: